

## TITLE OF THE INVENTION

Non-Rotating Display Wheel Cover Assembly

## CROSS-REFERENCE TO RELATED APPLICATIONS

Not applicable

## STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

Not applicable

## INCORPORATION-BY-REFERENCE OF MATERIAL SUBMITTED ON A COMPACT DISC

Not applicable

## BACKGROUND OF THE INVENTION

### Field of the Invention

This invention relates generally to vehicle wheel covers, and more particularly to a commercial display wheel cover including a quick disconnect mechanism permitting convenient wheel lug nut retorqueing and a replaceable display disc which remains substantially stationary with respect to the vehicle while the vehicle is moving.

### Description of Related Art

The central outer portion of a vehicle wheel, being fully viewable while the vehicle is in motion, provides an opportunity for the placement of readable graphics in this otherwise merely decorative or unornamental portion of the wheel of larger utility vehicles such as buses or trucks. The utilization of this otherwise merely unadorned space is contingent upon the readability of graphics and word messages being held relatively stationary with respect to the vehicle in motion. A number of prior art patented inventions address this display and advertising opportunity.

In U.S. Patent 5,659,989, Hsiao teaches a wheel cover which includes an outer disc member which is rotatably mounted to an inner base member so that the display indicia applied to the disc member will remain substantially rotation free under vehicle movement. This disclosure includes stabilizing structure to maintain alignment and restrict oscillation of the outer disc member bearing the viewable indicia thereon.

Boothe, in U.S. patent 5,957,542 discloses a theft-proof, non-rotational wheel cover with replaceable ornamental outer surface. This arrangement relies upon and is engageable within the central cavity of the automotive wheel.

Another advertising display device for a vehicle wheel is disclosed by Ryan in U.S. Patent 2,548,070. In this arrangement, however, the device is adapted for attachment to a non-rotatable axle of the motor vehicle.

In U.S. Patent 2,869,262, Lucas teaches another wheel-supported advertising sign arrangement which appears to attach in rotatable fashion to the outer hubcap of the wheel assembly.

In the disclosure of Kovalenko, in U.S. Patent 4,280,293, a stationary display member is attachable to the vehicle hub and utilizes a flowable material such as mercury acting upon veins within a chamber of the device to substantially eliminate rotation of the bearing-mounted outer display member.

A non-rotating wheel cover assembly shown in U.S. patent 5,588,715 invented by Harlen teaches yet another wheel cover assembly which is attachable to the outer end of an axle by separate bracketry to support the bearing mounted display member. A thickened lower portion of the wheel cover provides sufficient counterbalance to inhibit or prevent rotation of the display cover while the vehicle is in motion.

Matsushita discloses a free wheel cap in U.S. patent 4,678,239 which teaches a non-rotating wheel cover having a counterbalanced disc-like body which is bearing connected to an inner multi-arm structure having spring-like clips connected at the outer periphery of the device which interengage with the wheel rim.

Another wheel cover was invented by Okamoto and disclosed in U.S. Patent 6,120,104 teaching a flexible side feature connected to the center of the wheel in support of a display wheel cover. An air current guide is formed into the display cover which assists in stabilizing the display portion without substantial rotational movement as the vehicle is moving.

Other prior art devices which teach vehicle wheel display covers are as follows:

U.S. Patent 710,195 to Jones

U.S. Patent 2,014,058 to Tonai

U.S. Patent 2,169,237 to Gasco

U.S. Patent 4,781,419 to Boothe

U.S. Patent 5,190,354 to Levy

U.S. Patent 5,490,342 to Ruterman

U.S. Patent 6,536,848 discloses a display wheel cover which is substantially non-rotating with respect to the vehicle when in motion and which, in a preferred embodiment, utilizes a unique inner member having an elongated hat-shaped section that facilitates attachment to the rim of the wheel by threadably adjustable rim-engaging members that align into the concave groove formed in the outer wheel rim. A unique cam-locking device both retains the outer display wheel cover in place and also prevents its theft removal as a separate security feature requiring a special tool for removal.

## BRIEF SUMMARY OF THE INVENTION

This invention is directed to a display wheel cover assembly uniquely connectable to, and removable from, a rotatable wheel of a vehicle. This invention includes an adapter plate releasably connectable by unique replacement lug nuts to the outside of the wheel serving as combination spacers and lug nuts. A support bearing member is connected coaxially with a hub of the adapter plate. A wheel cover including a key-actuated locking support having a coaxially extending support shaft is rotatably supported in the support bearing member. An elongated cylindrical locking member is positioned within a longitudinal aperture formed through the support shaft, while a cam member, connected to a distal end of the locking member, has a non-symmetric periphery such that, when properly rotatably orientated, is fully insertable into said support bearing member. In a second rotational orientation, the cam member prevents withdrawal of the support shaft from the support-bearing member. A counterweight attached to the wheel cover prevents rotation of the wheel cover. Interchangeable display indicia attach to the wheel cover.

It is therefore a broad object of this invention to provide a non-rotating wheel cover for a commercial utility vehicle or truck which will facilitate the application of decorative and readable commercial display indicia such as in advertising while the vehicle is moving.

It is yet another object of this invention to provide an advertising display cover for the wheel of a commercial vehicle which is easily interchangeable and which is rendered secure from inadvertent or theft removal by a unique locking arrangement.

Still another object of this invention is to provide an advertising display cover for the wheel of a vehicle which receives support from the lugs of the axle of the vehicle through the use of uniquely configured double-duty wheel lug nuts serving as spacers and lug extensions.

Yet another object of this invention is to provide an advertising display cover for the wheels of commercial vehicles which is easily removable to facilitate regular servicing and tightening of the unique lug nuts which hold the wheel onto the axle and also support the wheel cover.

In accordance with these and other objects which will become apparent hereinafter, the instant invention will now be described with reference to the accompanying drawings.

#### BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING(S)

Figure 1 is an exploded perspective view of one embodiment of the invention shown in conjunction with a wheel of a vehicle.

Figure 1A is an exploded perspective view of another embodiment for attachment to vehicles having a central axle hub bolt pattern.

Figure 2 is a front elevation view of the assembled invention shown in Figure 1 in a locked position absent retainer plate (20) for clarity.

Figure 3 is a view similar to Figure 2 in an unlocked position.

Figure 4 is an enlarged section view in the direction of arrows 4-4 in Figure 2.

Figure 5 is an enlarged section view in the direction of arrows 5-5 in Figure 3.

Figures 6 and 8 are front elevation views of the assembled invention of Figure 1 in the locked and unlocked position, respectively.

Figures 7 and 9 are enlargements of areas 7 and 9 of Figures 6 and 8, respectively.

Figure 10 is an exploded perspective view of a universal embodiment of the invention.

Figure 11 is a cross section view of the assembled embodiment of the invention of Figure 10.

Figure 12 is an enlargement of area 12 of Figure 11.

Figure 13 is an exploded perspective view of the wheel cover locking support assembly 100 shown in Figure 10.

Figure 14 is a front elevation view of Figure 13 in the locked position.

Figure 15 is a section view in the direction of arrows 15-15 in Figure 14.

Figure 16 is a perspective view of Figure 15 absent member 102.

Figure 17 is a front elevation view of Figure 13 in the unlocked position.

Figure 18 is a section view in the direction of arrows 18-18 in Figure 17.

Figure 19 is a perspective view of Figure 18 absent member 102.

Figure 20A is a perspective view of the retainer 68 of Figure 10.

Figure 20 is a perspective view of the wheel rim universal adapter plate, and retainer of Figure 10 in the unlocked orientation.

Figure 21 is an enlargement of area 21 of Figure 20.

Figure 22 is a perspective view of the wheel rim, universal adapter plate, and retainer of Figure 10 in the locked orientation.

Figure 23 is an enlargement of area 23 of Figure 22.

Figure 24 is a top plan view of a locking key in position for actuating the wheel cover locking support 100 of Figure 10.

Figure 25 is a section view in the direction of arrows 25-25 of Figure 24.

Figure 26 is a perspective view of Figure 24.

Figure 27 is a perspective view of the locking key of Figure 24.

#### DETAILED DESCRIPTION OF THE INVENTION

Referring now to the drawings, and particularly to Figures 1 to 9, one broad aspect of the invention is there shown generally at numeral **10** in Figure 1. This aspect **10** of the invention includes an adapter plate **12** which supports a bearing arrangement **16** connected in coaxial alignment with a bearing support hub **28** of the adapter plate **12**. This aspect **10** also includes a retainer **18** which is supported over the hub **28** and held from relative rotation by a retainer plate **20**.

Attachment of the adapter plate **12** to a rim **R** of a wheel for a vehicle about the axle center line **D** is effected through the use of a uniquely configured lug nut **22**. As best seen in Figures 4 and 5, each of the lug nuts **22** is threadably adapted at a first end thereof **24** to threadably engage over a lug **L** anchored into the axle **C** which passes through each wheel mounting hole **H** of the rim **R**. For economy, it is preferred that at least three of these uniquely configured lug nuts **22** be utilized to attach the rim **R** to the axle **C**. The remaining conventional lug nuts (not shown) may be utilized to further secure the rim **R** to the axle **C**. The opposite or distal end of each of the lug nuts **22** includes a groove **26** radially inwardly extending as shown to define a head **H**, the purposes of which will be described herebelow.

The adapter plate **12** includes a central dish-shaped area **14** supporting the hub **28** which supports the bearing arrangement **16** as previously described. A mounting flange **54**, offset and radially extending from the central area **14**, has threaded mounting holes **52** which provide the attaching means through aligned holes **50** adjacent the periphery of retainer plate **20** by conventional threaded fasteners (not shown for clarity).

Also disposed on the central area **14** is a plurality of apertures **32** each having a partial cover **30** defining an interior cavity **34** associated therewith. The diameter of the mounting apertures **32** is sized for close snug fitting over the distal head **26** of each of the lug nuts **22**. The cylindrical cavity **34** is also similarly sized as a uniform extension of mounting aperture **32** to receive the head **26** as best seen in Figures 4 and 5. The distal end surface **26a** of each of the heads **26** abuts against the bottom of the cavity **34** and against the inner surface of the cover **30**. Note that shoulder **22a** of each of the lugs nuts **22** also bears against the inner surface of each of the mounting apertures **32** for added support and arcuate positioning of the groove **36** with respect to the outer surface of central area **14** for the purposes described herebelow.

The retainer **18** receives support for rotation by the close sliding alignment of the central aperture **56** over hub **28**. The retainer plate **20** is, as previously described, attached to the outer flange **54** of the adapter plate **12** by threaded fasteners through aligned holes **50** and **52**. The retainer **18** is attached at threaded cavity **42** to the retainer plate **20** by a threaded fastener **44** fitted through elongated slot **46** of the retainer plate **20**. As will be described herebelow, the retainer **18** is thus held for very limited rotational movement about axis **D** when fastener **44** is loosened as limited by the elongated slot **46**, the purposes of which will be described herebelow.



The retainer **18** also includes a plurality of spaced radially extending locking tabs or fingers **38** which are laterally offset from the central portion **40** of the retainer **18**. Tabs or fingers **38** are spaced rotationally about axis **D** to be identical to (or matching) the rotational spacing of each of the mounting apertures **32** and corresponding lug nuts **22**. Again, for economy, only three such combinations of lug nuts **22**, mounting apertures **32** and fingers or tabs **38** are provided as being deemed sufficient for attachment of this entire arrangement **10** to the rim **R** as previously described.

With this arrangement **10** assembled onto the rim **R** as previously described, the retainer **18** may be rotated about axis **D** only very limited amount as permitted by slot **46** when the threaded fastener **44** is loosened. Movement of this retainer **18** is between an unlocked and a locked position with respect to the retention or release of the adapter plate **12** with respect to the lug nuts **22** and the heads **26** thereof. As seen in Figures 2, 4, 8 and 9, when the threaded fastener **46** is tightened after limited rotational movement of the retainer **18** in the direction of arrow **A** in Figure 2, the locked position of the retainer **18** is established. In this orientation, each of the tabs or fingers **38** are positioned into the grooves **36** to prevent any axial movement of the adapter plate **12** with respect to the lug nuts **22**. In this locked orientation of the adapter plate **12**, the additional components of the entire system (described herebelow) including the wheel cover locking support **100** and the wheel cover **130** itself as shown in Figure 10, which bears the advertising or viewable indicia which remains stationary during vehicle movement, may then be attached as described herebelow.

To release or unlock the adapter plate **12** from the lug nuts **22**, threaded fastener **44** is simply loosened and then may be utilized to rotate the retainer **18** in the direction of

arrow **B** in Figure 3 to disengage each of the fingers or tabs **38** from the corresponding grooves **36**. Note that the partial covers **30** partially surrounding each of the mounting apertures **32** also provide a relative degree of protection from dirt accumulation in this critical engagement area between the heads **26** and corresponding grooves **36**, mounting apertures **32** and locking tabs or fingers **38**.

Referring now to Figure 1A, a rear axle flange **M** associated with large trucks and busses is assembled together by lugs **N** through mating apertures **H'** which are separate from the lugs **J** and lug nuts **K** which attached the rim **R'** to the axle of the truck or bus. The larger bolt circle for the wheel mounting lugs **J** and lug nuts **K** are formed into the central web **P** of the rim **R'** as shown.

To accommodate this axle hub **M** arrangement, a shortened elongated attaching lug **22'** is provided. This attaching lug **22'** has a first end **24'** which is threaded similar to lug **N** and is threadable into the threaded cavities **H'** of the axle hub **M**. Typically, there are eight or ten such lugs **N** utilized to assemble the axle hub **M** and it is thus preferred to replace only a portion (typically three) of those standard lugs **N** by the attaching lugs **32'** to provide adequate strength. As previously described, after the attaching lugs **22'** are installed into the portion of the threaded holes **H'**, the threaded opposite ends **26** of the attaching lugs **22'** are passed through the mounting holes **32** and thereafter, into locking engagement within cavities **34**.

Once the adapter plate **12** is lockingly secured to the lug nuts **22** by the retainer **18** and retainer plate **20**, the outer commercial display wheel cover **130** as seen in Figures 10 to 12, may then be installed. The wheel cover locking support **100**, as shown in detail in Figures 13 to 18, is provided to effect installation of the wheel cover **130**. The wheel

cover locking support **100** includes an elongated support shaft **104** and an enlarged orthogonally extending mounting flange **102** having threaded attaching apertures **138** which are aligned with apertures **136** of the wheel cover **130** as seen in Figure 10. The outer cylindrical surface of the support shaft **104** is closely aligned for snug close sliding insertion into the inside diameter of the bearing arrangement **16** in Figure 1 and **66** in Figure 10. By this arrangement, the support shaft **104** with the wheel cover **130** rigidly attached to flange **102**, is slidably supportively engageable into the bearing arrangement **16** or **66**.

The locking or anti-theft features of this invention include an elongated locking member **106** which snugly and slidably engages for rotation within an elongated aperture or passageway formed longitudinally through the support shaft **104**. Note importantly that the separate axis **E** of the elongated locking member **106** and mating passageway are offset and parallel to the longitudinal axis **D** which is concentric with the outer cylindrical surface of the support member **104**, the rim **R** and the vehicle axle.

A cam member **120** is mechanically attached by a threaded nut **122** onto the distal end of the support shaft **104**. A detent plunger **114** is biased by spring **118** to act within an arcuate cavity **142** of actuator **110** which is engaged over the head **108** within mating cavity **124** of locking support **100**. Relative axial rotation of the support shaft **104** is thus limited by the sliding movement of the detent plunger **114** within the arcuate cavity **142**. When in the position shown in Figures 14 to 16, the detent plunger **114** is urged into a locking cavity **112** formed at one end of the arcuate groove **142**. This locked position coincides with the cam member **120** being misaligned at **154** as best seen in Figure 15 with the outer cylindrical surface of the support shaft **36**. This establishes the locked

position of the cam member **120** wherein shoulder **152** and surface **154** precisely straddle and mate against the outer end surfaces of the bearing arrangement **16** or **66**.

When the locking member **106** is rotated into the position shown in Figures 17 to 19 wherein the plunger **114** moves out of the locking cavity **112** to the opposite end of the arcuate cavity **142**, the cam member **120** is precisely aligned with the cylindrical outer surface of the support member **104** whereupon the wheel cover locking support **100** may be slidably withdrawn axially from engagement within the bearing arrangement **16** or **66**.

Referring additionally to Figures 24 to 27, a locking key **144** is there shown. This locking key **144**, which includes a longitudinal body **146** and a handle **148**, is shown engaged within mating cavities **156** of the adapter **110**. One of the pins **150** is shown inserted into one of these cavities **156** which is aligned with locking detent cavity **112**, while the other cavity receives the other drive pin **150** to effect rotation of the locking member **106**. By insertion of the pins **150** into these cavities **156** when the locking member **106** is in the locked position shown in Figures 14 to 16, the detent plunger **114** is forced to withdraw against biased spring pressure from spring **118** from detent cavity **112** a distance sufficient to then allow rotation of the locking member **106** and the sliding movement of the detent plunger **114** along the arcuate cavity **142** to effect unlocking and removal of the wheel cover locking support **100** as previously described.

Referring now to Figures 10 to 12 and 20A to 23, a universal embodiment of the invention is there shown generally at numeral **60** in Figure 10. The majority of the components, including the rim **R**, each of the lug nuts **72** except with respect to overall length as compared to lug nut **22**, the bearing arrangement **66** which is substantially identical to the bearing arrangement **16** previously described, and retainer plate **70** which

is structured for attachment to the flange **58** of the universal adapter plate **62** (described herebelow) are as previously described. Likewise, the same wheel cover locking support **100** and wheel cover **130** having an adaptive outer surface for receiving printed indicia such as in the form of advertising display material are included in this embodiment **60**.

The distinctive aspect of this embodiment **60** surrounds the universal adapter plate **62** and the associated universal retainer **68** as best seen in Figure 20A. In this embodiment **60**, the special multi-task lug nuts **72** as previously described, having a groove **86** and head **76** at the distal end thereof, are threadably engaged onto all of the lugs **L** provided with the axle of the vehicle through mounting holes **H** in the rim **R**. However, there are several axle stud and rim mounting hole **H** patterns of different bolt circle diameters and spacing, and even differences in the overall number of lugs provided for supporting the rim **R**. To accommodate a plurality of the more popular bolt patterns for mounting the rim **R**, the universal retainer **68** shown in Figure 20A is provided.

This universal retainer **68** includes the disc-shaped central portion **90** having mounting aperture **92** which aligns with the threaded fastener **94** within a slotted hole formed into the retainer plate **70** as previously described. Likewise, the central hole **158** is sized to slidably receive and be supported on the central neck **78** of the universal adapter plate **62**. However, this retainer **68** is provided with locking lugs or tabs **88** each of which include three separate tabs locking edge portions **88a**, **88b** and **88c** in five separate evenly spaced arrays to match the bolt circle pattern shown in Figure 10 and for engagement with all five of the lug nuts **72**.

As best seen in Figures 20 to 23, the universal adapter plate **62** also provides five separate clusters of three mounting apertures (not shown) formed through the central

portion **64** which are sized to snugly receive the heads **76** of each of the lug nuts **72**. Each of these five groups of three mounting apertures has a partial cover **80** which includes cover portions **80a**, **80b** and **80c**. Each of these cover portions **80a**, **80b** and **80c** provide a cylindrical interior surface which mates and is continuous with each of the mounting apertures as previously described with respect to the embodiment **12** previously described for proper stable positioning over each head **76**.

As seen in Figures 20 and 21, when the universal adapter plate **62** is rotated in the direction of the arrow as limited by the loosened threaded fastener **94**, each of the locking tab portions **88a**, **88b** and **88c** become disengaged from the corresponding grooves **86** within each of the lug nuts **72**. In this unlocked configuration, the universal adapter plate **62** is removable from the lug nuts **72** which then may be tightened to required specifications or removed for tire replacement.

In the locked position shown in Figures 22 and 23, the universal adapter plate **62** has been rotated in the opposite direction of that arrow as limited by the threaded fastener **94** as previously described. In this locked configuration, each of the locking tab portions **88a**, **88b** and **88c** are engaged into the corresponding groove **86** of each of the lug nuts **72**, whereupon the threaded fastener **94** is tightened and secured to maintain this locked and assembled deployment of the universal adapter plate **62**, retainer **68** and retainer plate **70** (not shown in these figures) during vehicle use.

While the instant invention has been shown and described herein in what are conceived to be the most practical and preferred embodiments, it is recognized that departures may be made therefrom within the scope of the invention, which is therefore

not to be limited to the details disclosed herein, but is to be afforded the full scope of the claims so as to embrace any and all equivalent apparatus and articles.